

HIGHLIGHTS

**TEN-STATE
Nutrition Survey
1968-1970**



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION
CENTER FOR DISEASE CONTROL
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The following material represents the highlights and conclusions of the Ten-State Nutrition Survey, conducted between 1968 and 1970. This is the largest nutrition survey ever conducted in the United States. The results presented here are a summary of the detailed data in the five volumes that comprise the full report.

A summary of the most important nutritional problems found by the survey is presented graphically on pages 4 and 5.

BACKGROUND

Congressional hearings early in 1967 dramatized the probability that serious hunger and malnutrition existed in the United States. Later that year, Congress directed the Department of Health, Education, and Welfare to determine the magnitude and location of malnutrition and related health problems in this country. At that time, because no such data were available, the Department gave the Nutrition Program the responsibility for carrying out a survey.

A series of ad hoc committees were organized by Dr. Arnold Schaefer, Chief of the Nutrition Program, to develop an over-all plan for conducting such a survey. These committees recommended that emphasis be placed on obtaining information from the low-income segment of the population, since it was here that malnutrition was expected to be most prevalent.

Because of constraints of time and money, the survey was limited to ten states: Washington, California, Texas, Louisiana, South Carolina, Kentucky, West Virginia, Michigan, Massachusetts, and New York (including a separate survey of New York City). In choosing the survey states, the Program staff considered both the pre-established criteria for selection and a state's supply of trained manpower and other available resources.

Within each state, the enumeration districts with the lowest average income (lowest quartile) according to the 1960 Census were identified. An appropriate sampling procedure was used to select the desired number of families from these enumeration districts.

Although the primary interest in each state was malnutrition among the poor, the population sampled did not include all of this lower income group within a state, nor was it restricted to only the poor. The income characteristics of some of these districts had changed since 1960, and some middle- and upper-income families

resided within districts having a low average income. The sampling procedure is believed to have yielded a representative sample of the low-income families, but those with higher incomes living within these areas, and who were included in the sample, might have special characteristics and not be representative of the middle- and high-income population. *Therefore the population studied was not representative of the entire population within a county or state, and the survey findings cannot be extrapolated and applied to the overall population of states from which samples were drawn.*

A common protocol, including standards and guidelines for the evaluation of the biochemical and dietary data, was developed by the Nutrition Program in consultation with various expert committees. In each state a group was identified – the state health department, or a university medical school department – who recruited a survey team and conducted the survey. The Nutrition Program provided consultation, technical assistance, monitoring, and analysis of data.

Almost 30,000 families were identified by the sampling procedure. Demographic data were obtained on 24,000 families containing over 86,000 persons. Included in this group are some “volunteers,” persons not included in the preselected sample. Further evaluation indicated that the volunteers did not differ in demographic characteristics from sample individuals.

All individuals were invited to participate in the clinical evaluation, which included a medical history, physical examination, anthropometric measurements, X-ray examination of the wrist, dental examination, and collection of blood for hemoglobin and hematocrit determinations. This evaluation of nutritional status involved approximately 40,000 individuals. Selected subgroups received more detailed biochemical and dietary evaluation. Among these subgroups were high-risk populations such as infants and young children, adolescents, pregnant or lactating women, and persons over 60 years of age.

There was a heavy representation of children in the group that received the detailed evaluation. More than 50 percent of the persons examined were 16 years of age or less; 30 percent were from 17 to 44 years of age; and the remainder (17 percent) were 45 years of age or older.

The largest percentage of persons in the sample was white; the next largest percentage was black, and the smallest percentage was Spanish-American. The latter group actually included two rather different populations: Puerto Ricans, predominantly from New York City, and Mexican-Americans from Texas and California.

Another important characteristic of the population was income status. Because adequate income is essential to the provision of adequate nutrition, this factor was carefully evaluated. Income level was expressed in terms of a Poverty Income Ratio (PIR) for each family. As proposed by Orshansky,¹ this ratio related certain income characteristics of a given family to a defined “poverty” level. Thus a family with an income exactly at the poverty level had a PIR of 1.0. If income was twice the poverty level, the PIR was 2.0; if half the poverty level, the PIR was 0.5. The poverty index for each family was determined by specific characteristics such as family size, sex of the head of household, and place of residence (i.e., farm or non-farm), all of which affect family income. Since PIR reflects all these factors, it is more useful than an absolute dollar figure as an indicator of economic status. However, the PIR does not take into account the differences in living costs in different parts of the country. Thus it cannot be assumed that families in different regions who fell within the same PIR classification did in fact have the same degree of financial limitation.

¹Mollie Orshansky, “The Shape of Poverty in 1966.” *Social Security Bulletin*. March 1968.

The graphic presentation following this page summarizes the relative importance of those nutritional problems identified by the Ten-State Nutrition Survey. The presentation involves some judgments and generalizations that cannot reflect all the finer differences among various subgroups of the population.

The symbols represent relative degrees of importance as public health problems.



HIGH



MEDIUM



LOW



MINIMAL



NOT
AVAILABLE

THE TEN-STATE NUTRITION SURVEY 1968-1970

HIGH-RATIO STATES CALIFORNIA, MASSACHUSETTS, MICHIGAN, NEW YORK (and NEW YORK CITY), WASHINGTON

iron	protein	vitamin A	vitamin C	riboflavin	thiamine	iodine	growth & development	obesity	SEX	AGE	ETHNIC GROUP
●	○	●	○	●	○	○	●	—	both	0-5 years	BLACK
●	○	●	○	●	○	○	●	—	both	6-9 years	
●	○	●	○	●	○	○	●	●	females	10-16 years	
●	○	●	○	●	○	○	●	○	males		
●	○	○	○	●	○	○	—	●	females	17-59 years	
●	○	○	○	●	○	○	—	○	males		
●	○	○	○	●	○	○	—	●	females	over 60 years	
●	○	○	○	●	○	○	—	○	males		

LEGEND

-  HIGH PREVALENCE OF DEFICIENT VALUES
-  MEDIUM PREVALENCE OF DEFICIENT VALUES
-  LOW PREVALENCE OF DEFICIENT VALUES
-  MINIMAL DEFICIENCIES
-  FIGURES NOT AVAILABLE

●	○	●	○	●	○	○	●	—	both	0-5 years	WHITE
●	○	●	○	○	○	○	●	—	both	6-9 years	
●	○	●	○	○	○	○	●	●	females	10-16 years	
●	○	○	○	○	○	○	●	○	males		
●	○	○	○	○	○	○	—	●	females	17-59 years	
●	○	○	○	○	○	○	—	○	males		
●	○	○	○	○	○	○	—	●	females	over 60 years	
●	○	○	○	○	○	○	—	○	males		

●	○	○	○	○	○	○	●	—	both	0-5 years	SPANISH-AMERICAN
●	○	○	○	○	○	○	●	—	both	6-9 years	
●	○	○	○	○	○	○	●	—	females	10-16 years	
●	○	○	○	○	○	○	●	—	males		
●	○	○	○	○	○	○	—	—	females	17-59 years	
●	○	○	○	○	○	○	—	—	males		
●	○	○	○	○	○	○	—	—	females	over 60 years	
●	○	○	○	○	○	○	—	—	males		

●	●	○	—	—	—	—	—	—	Pregnant and lactating women	
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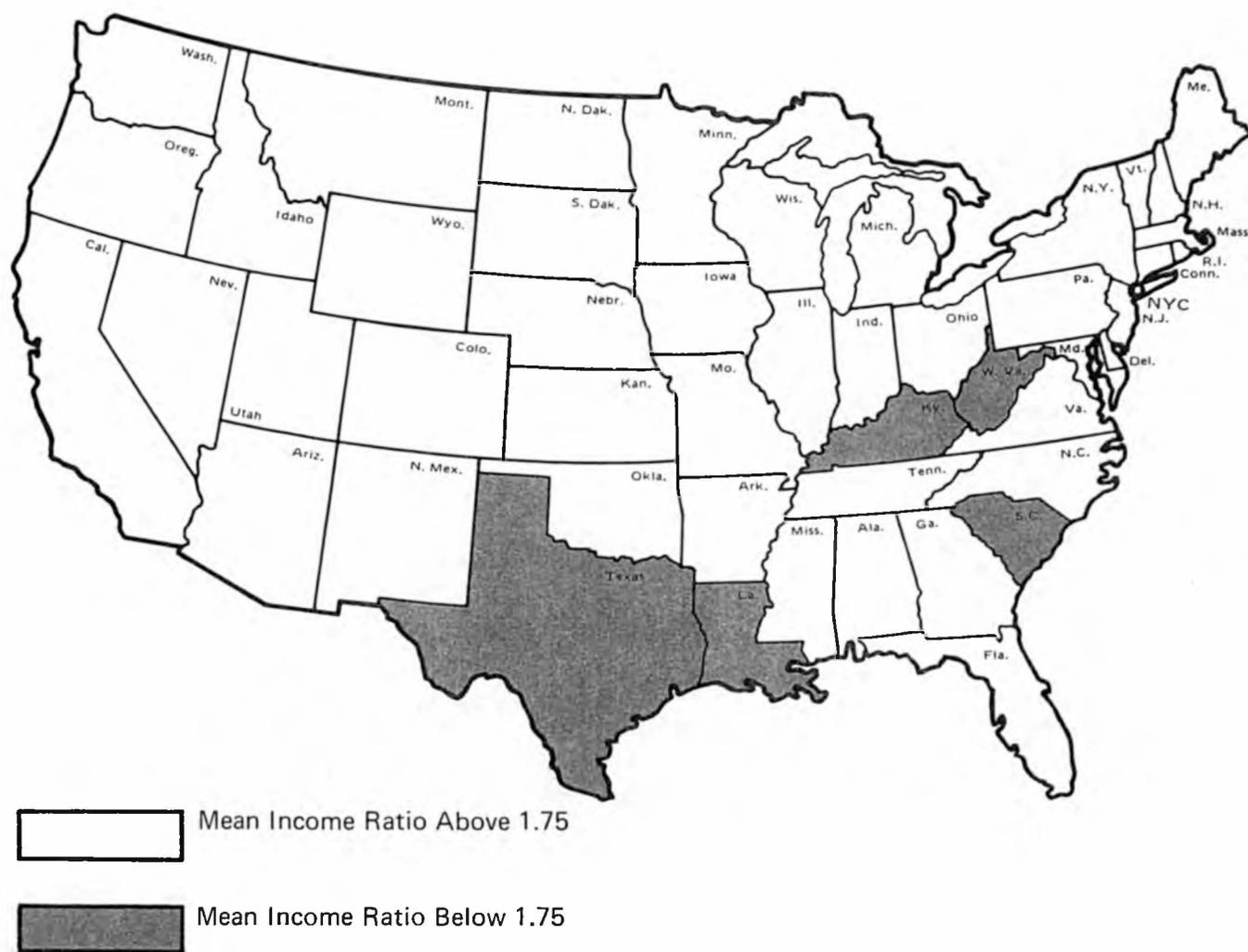
The graphic summary on the preceding pages was designed to be detachable from this volume. Additional copies are available on request from the:

Center for Disease Control
Attention: Nutrition Program
Atlanta, Georgia 30333

A large proportion of the families included in the survey were living below or only slightly above the poverty level. However, mean values for PIR varied widely from state to state and it was possible to divide the ten states and New York City into two large subsamples based on PIR (Figure 1). In one group of states, identified as "low-income-ratio states," more than half of the families were living at a "below poverty" level. In the second group of states, the "high-income-ratio states," more than half of the families were classified as living "above poverty." These two groups of states were evaluated separately so that comparisons could be made reflecting the effects of both regional and economic factors on nutritional status. Further division of the data by individual state was not made since numbers would have been too small for meaningful analysis by the various parameters employed such as age, sex, ethnic group and PIR.

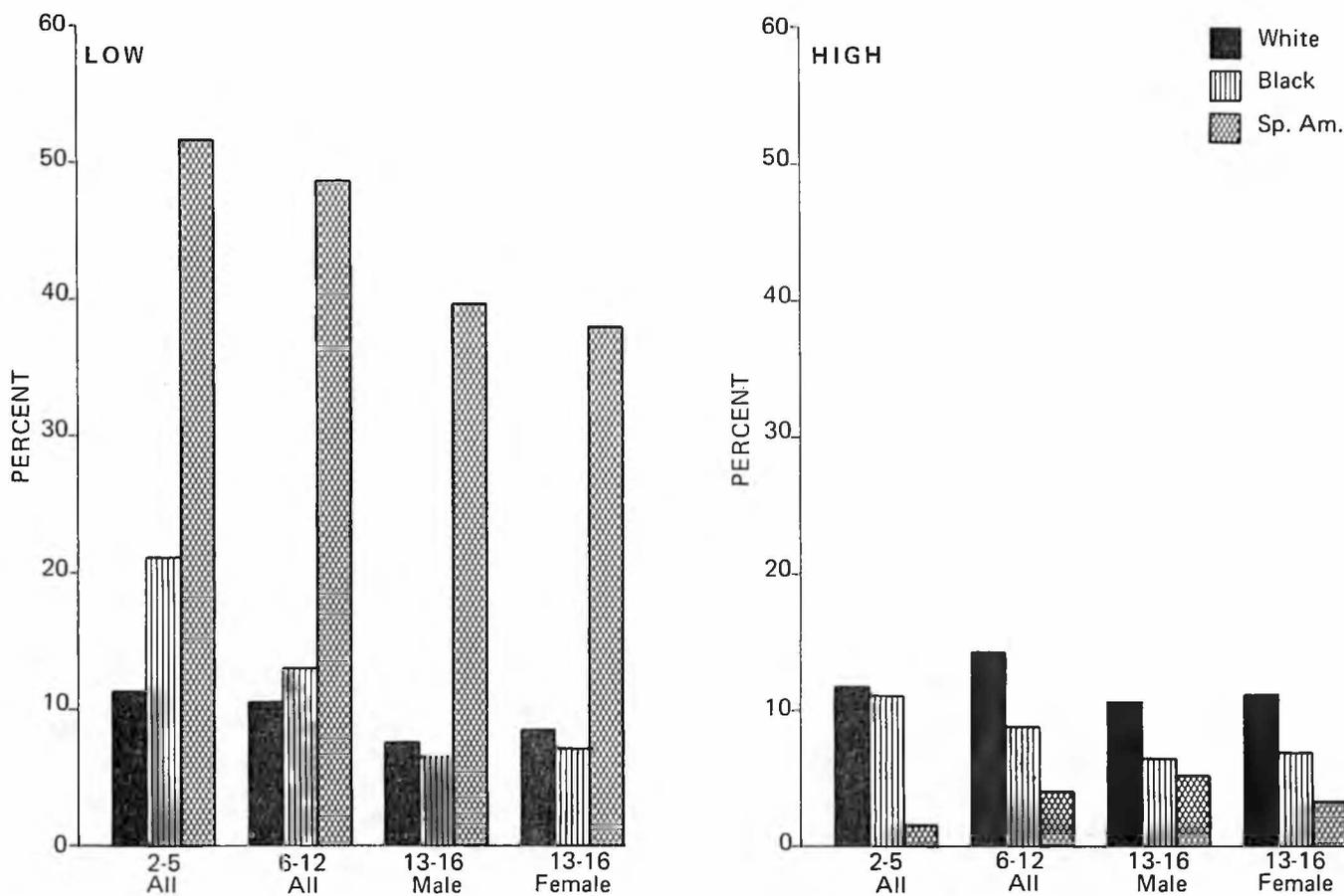
In addition to PIR, there were other basic differences between the two groups of states. The distribution of families by ethnic group varied widely from state to state. The median years of school completed by individuals was lower in the low-income-ratio states. Generally, there were more black families in the low-income-ratio states.

FIGURE 1. Low and High Income Ratio States – *Ten-State Nutrition Survey (1968-1970)*



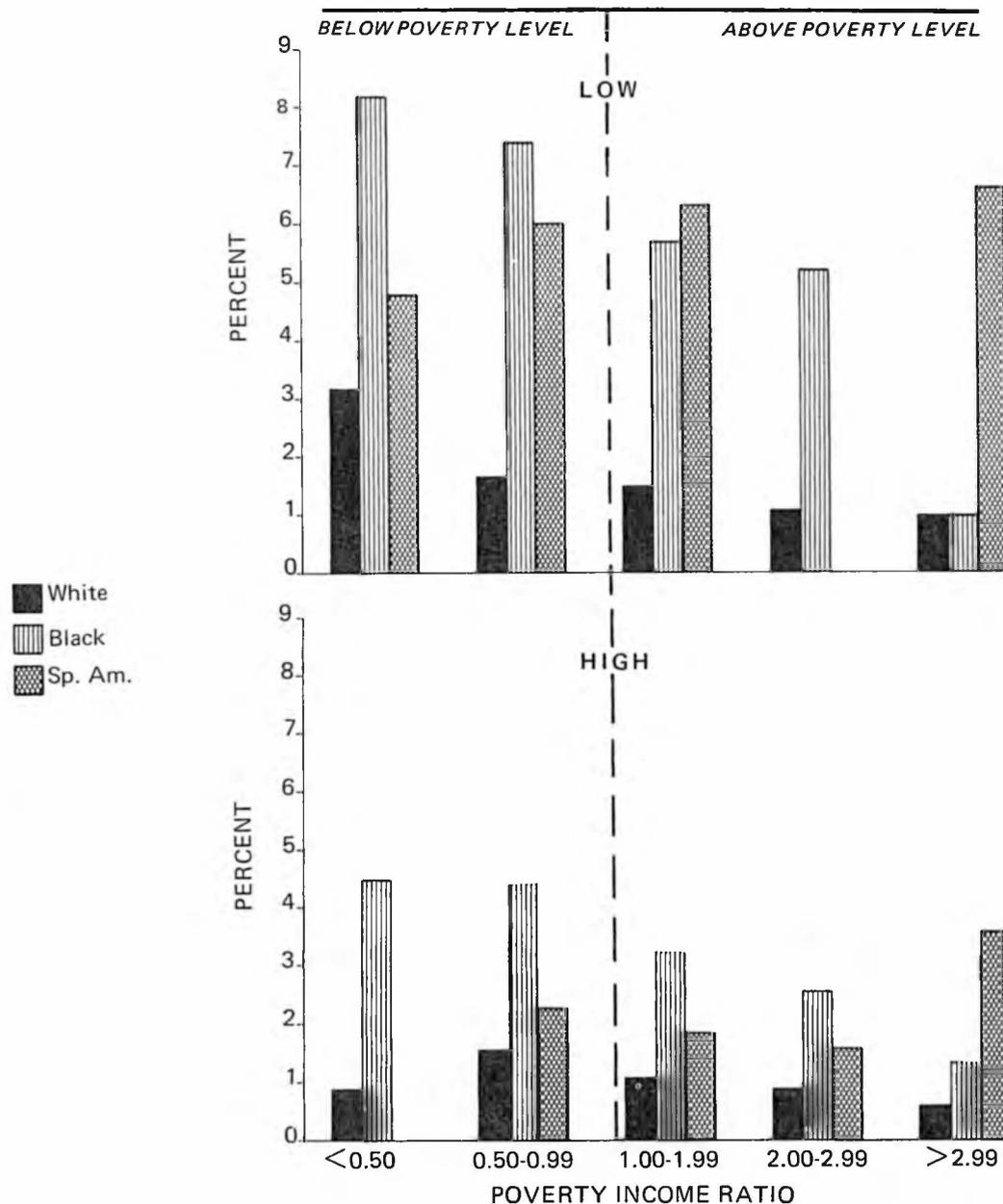
The results of the Ten-State Nutrition Survey indicated that a significant proportion of the population surveyed was malnourished or was at high risk of developing nutritional problems. However, malnutrition in different segments of the population varied in severity and in regard to the specific nutrients involved. An outstanding example of this variation was the high prevalence of low vitamin A values among Mexican-Americans in the low-income-ratio states as contrasted to the absence of vitamin A problems in Puerto Ricans in the high-income-ratio states, primarily in New York City (Figure 2). The findings show that the characteristics of malnutrition are often unique to the local situation and to the specific subsegment of the population being surveyed. Nutritional solutions to the different types of malnutrition encountered will vary among different segments of the population having different social, cultural, and economic characteristics.

FIGURE 2. Percent of Persons with Deficient or Low Vitamin A Levels by Ethnic Group and Selected Ages for Low and High Income Ratio States – *Ten-State Nutrition Survey (1968-1970)*



Because the kinds and degrees of malnutrition vary from one locality to another, generalizations tend to be misleading. However, in this survey, evidence of malnutrition was found most commonly among blacks, less commonly among Spanish-Americans, and least among white persons. Generally there was increasing evidence of malnutrition as income level decreased (Figure 3). Within each ethnic group, nutritional deficiencies were often more prevalent in the low-income-ratio states than in the high-income-ratio states. This finding reflects, in part, the lower income level of individuals living in the low-income-ratio states. But, even when comparing these people with individuals of similar ethnic background and income level in the high-income-ratio states, the prevalence of nutritional inadequacies continued to be higher in the low-income-ratio states. These findings indicate that although income is a major determinant of nutritional status, other factors such as social, cultural, and geographic differences also have an effect on the level of nutrition of a population group.

FIGURE 3. Percent of Persons in Selected Poverty Income Ratio Groups with Deficient Hemoglobin Levels, Low and High Income Ratio States – *Ten-State Nutrition Survey (1968-1970)*



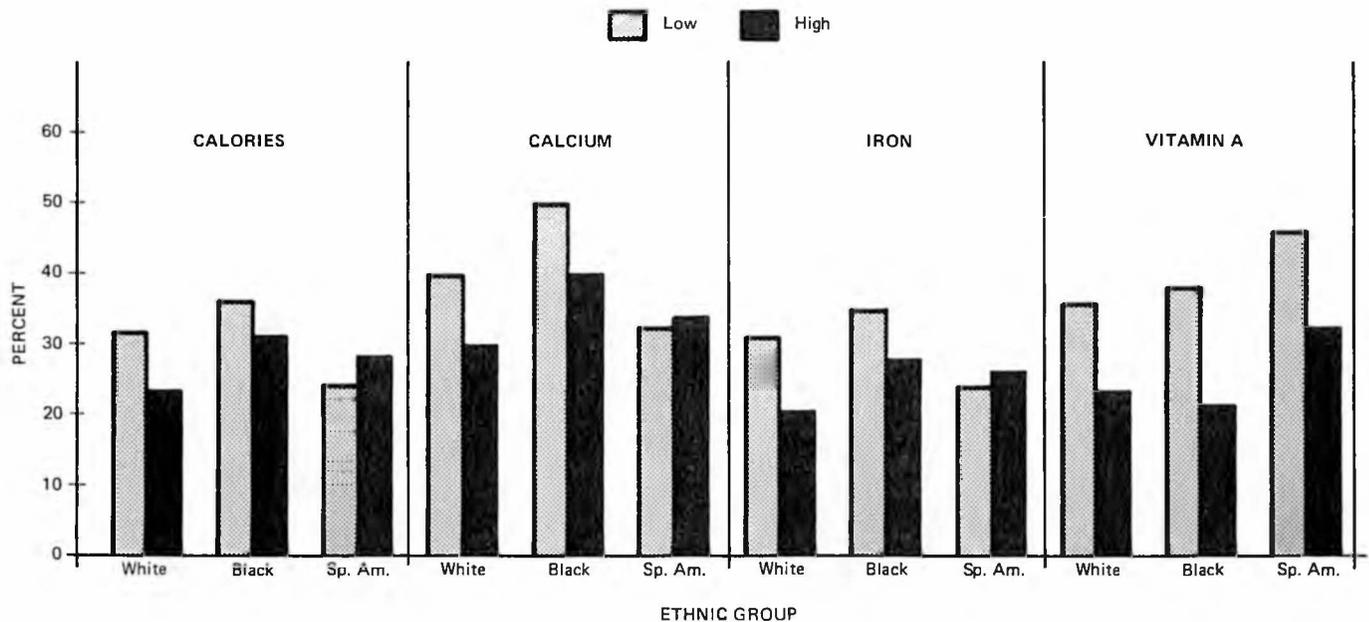
Among the various age groups surveyed, adolescents between the ages of 10 and 16 years had the highest prevalence of unsatisfactory nutritional status. Male adolescents had more evidence of malnutrition than females. Elderly persons were another age group with evidence of increased nutritional deficiencies. Persons over 60 years of age showed evidence of general undernutrition which was not restricted to the very poor or to any single ethnic group.

The educational attainment (the number of years of school completed) of the person usually responsible for buying and preparing the family's food was related to the nutritional status of children under the age of 17. As the homemaker's educational level increased, the evidence of nutritional inadequacies in the children decreased. Among adults, there was also a positive relationship between the number of years of school completed by the individual and his or her nutritional status. However, since the number of years of school completed is associated with other factors affecting nutrition, such as income status, it is not possible to identify these findings as the specific effect of education.

There was evidence that many persons made poor food choices that led to inadequate diets and to poor use of the money available for food. In particular, many households seldom used foods rich in vitamin A. Also, there was a heavy emphasis on meat in many diets, rather than use of less expensive but excellent protein sources such as fish and poultry, or legumes and nuts. Many diets were also deficient in iron content, but this was less a reflection of poor choice of foods than of the generally low level of iron in the American diet. The dietary data also showed that there were a substantial number of children and adolescents with caloric intakes below the dietary standards.

Poor dental health associated with low levels of dental care was encountered in many segments of the population. In adolescents it was found that between-meal snacks of high carbohydrate foods such as candies, soft drinks, and pastries were associated with the development of dental caries. This finding illustrates the potential detrimental effect of poor nutrition on dental health.

FIGURE 4. Percent of Selected Nutrients Contributed by School Lunches for Children 10-16 Years of Age in Low and High Income Ratio States — *Ten-State Nutrition Survey (1968-1970)*



School lunch programs were found to be a very important part of nourishment for many children (Figure 4). Particularly in the low-income-ratio states, school lunches contributed a substantial proportion of the total nutrient intake of many school children. The contribution of school lunch to overall nutrition was particularly important among black children.

Height, weight, and other body measurements are useful in identifying populations where nutritional inadequacies are reflected in retarded growth and development. It was found that in the survey population there was an excess of underweight and undersized children and adolescents in all population subgroups studied when compared to standards commonly used in the United States. Since such findings are not fully explained in terms of income or other identifiable factors affecting nutrition, the adequacy of the current standards is questioned. However, nutrition is related in part to some identifiable factors.

Evidence of retarded growth and development was generally more prevalent in the low-income-ratio states; and within each group of states, growth was less adequate in lower income groups. Also, despite lower income levels, black children generally were taller than white children and were more advanced in skeletal and dental development, indicating that racially based differences as well as nutritional factors affect growth. These differences suggest the need for the development of appropriate standards specifically for black children.

Obesity is a nutritionally related problem of significant public health concern because of its association with increased rates of diabetes, certain cardiovascular diseases, and other chronic diseases. Obesity was found to be most prevalent in adult women, particularly black women. In some age groups more than 50 percent of adult women were found to be obese. Men were less frequently obese, although white males in both the adolescent and the adult age groups had a relatively high prevalence of obesity when compared with black males. The wide range of caloric intakes seen in the dietary data was consistent with the finding of large numbers of both underweight and overweight children and adolescents.

In regard to problems with specific nutrients, the following major points can be summarized:

Iron. A high prevalence of low hemoglobin and hematocrit values was found throughout all segments of the population. These low levels of hemoglobin were associated with low levels of serum iron and serum transferrin saturation, and, to a lesser extent, with low levels of serum and red blood cell folic acid. The evaluation of iron intake data in relation to hemoglobin levels showed a tendency for lower hemoglobin levels to be associated with lower dietary iron intakes. One can conclude from the Ten-State Nutrition Survey data that iron deficiency anemia, as evidenced by a high prevalence of low levels of hemoglobin, is a widespread problem within the population surveyed.

An unexpected finding was that many adolescent and adult males had low hemoglobin levels. Because males normally have higher hemoglobin levels than females, different standards are used in evaluating anemia in the different sexes. The finding of a high prevalence of low hemoglobin levels in males indicates either that the standards for males should be revised or that there was a heretofore unappreciated problem of anemia among males. The low levels of hemoglobin in the total population appear to be due largely to nutritional iron deficiency. A solution to this nutritional problem for most segments of the population would probably necessitate making foods available in the market place with a higher iron-to-calorie ratio than presently available.

Protein. A relatively large proportion of pregnant and lactating women demonstrated low serum albumin levels, suggesting marginal protein nutriture in this group. In contrast, dietary protein intakes were generally well above levels considered to be adequate. Thus the high prevalence of low albumin levels may reflect inadequate standards for this group, even though the optimum level of protein required during pregnancy has not been satisfactorily determined. Since the outcome of pregnancy is known to be relatively unsatisfactory in low income groups compared to the national average and since there is an excess of low-birth-weight babies in the same groups, this problem demands special attention.

Vitamin A. Based on evidence from the biochemical measurements and the analysis of the dietary intake data, Spanish-Americans in the low-income-ratio states, mainly Mexican-Americans in Texas, had a major problem in regard to vitamin A nutriture. The lack of supporting clinical evidence of vitamin A deficiency should not minimize the potential in this population group for the development of major health problems related to inadequate vitamin A nutriture. In addition to the more serious problems noted among the Spanish-American population, young people in all subgroups had a high prevalence of low vitamin A levels.

Vitamin C. Although vitamin C nutriture was not a major problem among any of the groups studied, males generally had a higher prevalence of lower vitamin C levels than did females. The prevalence of poor vitamin C status increased with age.

Riboflavin and Thiamine. Riboflavin and thiamine nutriture was evaluated from urinary excretion studies. Nutritional status in relation to thiamine did not appear to be a problem. Riboflavin status was poor among blacks and among young people of all ethnic groups.

Iodine. The data from this survey showed no evidence of iodine deficiency and no relationship between the prevalence of goiter and iodine status, suggesting that the goiter seen did not result from iodine deficiency. Goiter was found to be more prevalent than expected, especially in areas not previously thought to be goitrous. Goiters, however, were less prevalent and were smaller than those found in the years before the iodization of salt became widespread. Iodized salt was not regularly available or used in all communities surveyed.

It must be realized that this and other current surveys are limited to the study of only a few of the essential nutrients—some dozen nutrients of the more than forty known to be essential for good health. Little is known of the quantitative requirements of many nutrients; inadequate information is available on the distribution of nutrients in today's food supply; and methodology is not available to monitor the nutritional status for most essential nutrients. Current research suggests that a variety of essential but poorly studied nutrients—zinc, magnesium, and vitamin E, for example—may in fact be significant for some fraction of the population. Studies must be designed to answer these problems. In addition, it is essential that nutrition programs cope with questions resulting from new knowledge and from continuing social and technological change.